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Abstract

This paper will address the problem of storing web page content and documents in a static form and how that complicates business processes in a polling organization that publishes frequent reports and documents on its website. This paper will also describe how a Content Management System (CMS) can successfully resolve the problems associated with static content. The process of implementing the CMS with PHP and MySQL will also be described and illustrated. Furthermore, this paper will address the common issues that come up in project development and web development such as dealing with expanding scope, planning for change and taking advantage of the best web practices.

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Development of a Content Management System (CMS) for a small Polling Organization.

CHAPTER ONE: INTRODUCTION

PROBLEM STATEMENT

Public Polling Organization (PPO) is a small non-profit organization that aims to give the public a greater voice in the public policy process by seeking to discern public opinion on international and domestic issues and to communicate its findings to the policy community, academia and the press. PPO releases weekly polling studies that it uploads to its website and sends out to its list serve members in a email newsletter. The previous PPO study publishing process was extremely inefficient, costly and labor intensive due to problems with the static content, poor file organization and information being duplicated in multiple places and often outdated.

REVIEW OF EXISTING SITUATION

PPO releases weekly polling studies that it uploads on its website. A typical study consists of an html page with study content (main title, secondary titles, full text, links to other studies etc), images, and links to several PDF documents that contain reports, questionnaires and statistics. The problem with the web publishing techniques that PPO had in place was that all the files, images and content were static. Developing a study usually took about 20-25 hours of development time by the *webmaster* – an employee who is responsible for website updates and maintenance, as well as multiple hours by PPO support staff developing and proofreading the content. This included creating multiple static pages, some containing duplicate information that had to be changed if there were any additions or changes later on. The publishing process involved PPO's support staff generating several PDF documents that contained various reports (report of findings,

questionnaire, and press release) about the public's opinions on domestic or international issues. At that point, the webmaster updated the Home Page with the latest study, as well as created multiple html pages with related content. The process also involved the creation of multiple graphs and other accompanying images, and coding them throughout the multiple pages containing the same content. A typical study usually consisted of a summary that was placed on the Home page with a link to the full text of the study and several supporting PDF documents. Formatting HTML text by hand took a long time, furthermore, since the support staff would be revising the study before the release and checking it for typos and inconsistencies, the webmaster would receive numerous requests for editing the content. Multiple versions of the same documents, last minute changes and numerous people working on the content at the same time made publishing a study on the website a time consuming and error-prone process.

PPO's website consisted of four sections where studies were published. The Home page that had the most recently released study. The recent studies section, a list on the Home page that included approximately 10 links to the content of the most recent studies. Another Home page section was the latest studies section, which included links to the rest of the polling studies published over the past year (excluding the recent studies). The archived studies, a separate archive page, which included links to all of the studies ever produced and released electronically over the past 6 years. Those links would all lead to static html pages that contained the full text of a study with accompanying PDF documents. Because of the number of studies, there were around 500 pages on the server with inconsistent formatting, broken navigation, as well as missing images or links that resulted from moving those pages to different sections and not updating referring pages. Another problem was that finding a "lost" study was virtually impossible since there were no naming conventions in place and the file organization was extremely poor and

inconsistent, leading to an archiving process that was not well thought out. Most of the focus tended to be on the most recent studies, while the wealth of the organization's past published work was not effectively presented.

When a new study was released, the previously released study that resided on the front page was manually moved into the 'recent studies' section. Likewise, the last study from the recent studies section was moved to the 'latest studies' section. This shifting of studies around various sections had to be performed manually by the webmaster. This process included manually copying files and images to different folders, editing links to those files and folders, creating new headings in the appropriate sections (recent, latest or archived). This practice introduced the element of human error, created redundancy, the possibility of inconsistency across pages, and the possibility of missing some updates/changes.

In addition to performing all the above actions, the webmaster created an html version of the study for a newsletter that was e-mailed to PPO's list serve subscribers. Although the content was the same, the formatting and coding had to be different since the html content was processed by list serve e-mail servers and email clients such as Outlook, Yahoo, Hotmail etc . The newsletter looked similar to the front page with a summary of the study and a link to the page with the full text.

PPO did not have a database or any kind of a tracking system. All the statistics about which studies had been visited had to be compiled manually from the hosting company's web statistics. This took up a significant part PPO staff's time, but did not allow PPO to distinguish if the visitor clicked on a link to a study from the list serve newsletter or from the PPO website. Furthermore, the visitor data was very limited and did not allow PPO to see an accurate representation of what studies were read the most, what were the referring pages, what files were downloaded and so on.

PPO did not have any kind of a reporting system that would allow it to analyze the data. It is important for PPO to know that information in order to take appropriate actions regarding study distribution. Although PPO is a non-profit organization, its budget depends on receiving grants, and increasing the number of PPO's visitors and readers directly affects what grants PPO will be able to receive.

GOALS OF THE PROJECT

1. Develop a content management system (CMS) to eliminate the problems with static content, content duplication and inconsistencies.

The goal of the project was to develop a content management system (CMS), in order to improve the way the studies were stored, generated, distributed and organized. The database with a web interface would allow non-technical staff to create new studies/make updates, that would populate across all the pages that contained the information, in real-time. The system would eliminate redundancy/inconsistency, and provide a simple way to manage the placement of studies. The plan was to develop the CMS using the PHP programming language and MySQL database on the back end. The user interface was planned to be developed with W3C standard compliant HTML, CSS and JavaScript to ensure cross browser compatibility and accessibility.

2. Provide one place where changes to study content are made by non-technical personnel.

The CMS would offer one place to make updates, or upload new files, which would populate automatically across all the pages using that information, eliminating the need to make multiple changes. The system would also automatically move studies between front page, recent studies, latest studies and archives sections which would eliminate the need for that manual process.

3. Reduce study publishing time to 1-2 hrs

A typical study would take no more than 1-2 hours to complete with the CMS.

Furthermore, the new system would make gathering statistics and reports on what studies were visited and from what location easier.

4. Eliminate the involvement of the webmaster

The system would allow PPO non-technical staff to make the changes, and would significantly reduce the steps involved in the process of releasing a new study.

5. Improve website usability by re-organizing the content on the Home Page

In order for the system to be most effective, the home page of the PPO website would be made user-friendly, easy to navigate and use. Although not directly related to the CMS, achieving goal would significantly improve the overall organization and display of information and would enhance PPO users' experiences.

PROJECT CHALLENGES

The main challenges of this project arose from the communication with the client and client requirements and change requests. The senior management of PPO knew little about the technical aspects that were involved with CMS programming, web development or web content organization. There was a certain barrier in the "language" spoken and the level of technical details understood by the web team that was designing and developing the CMS and the client. The project required frequent meetings and a lot of the time was spent on explaining various details and aspects and the CMS as well as technical limitations of what could be done. Explaining the technical limitations and features was challenging due to the client's lack of understanding in today's web technology.

Another challenge arose during the development of the project: although all the requirements were discussed and gathered during the planning phase, the client continued to ask for significant changes and features during the implementation phase of the project. Although the client did not have a problem extending the budget, the initial structure of how the system was designed and coded was affected by the new features and change requests. Since the client assured that the initial requirements would not be extended much, the web team started developing the system in the most cost-effective and simple way. The web team did plan for possible changes, but some of the new requirements caused certain parts of the database and business logic to be revised in order to stay effective and follow the appropriate coding standards. The above was not only time consuming but required the project schedule and budget to be extended significantly.

AUTHOR'S ROLE

The author and her partner run a small web development business with roles of project management, design and development being distributed between the two of them. The project was initially brought to the author's attention by a friend who was a web master at PPO. Throughout the project, the author's partner and the author shared the responsibilities of the project manager – they met with the client, discussed requirements, performed demos and obtained feedback. The author was also the primary person developing the database system and the overall programming logic with the author's partner working on information architecture, the interface design, website re-design and front-end development.

SCOPE OF THE PROJECT

The initial scope of the project included the CMS and the dynamic page development that pertained to studies' storage, generation, distribution and organization. The

project scope included (1) the CMS: database, administrator web interface to manipulate the data in the database; (2) the appropriate changes to PPO's website templates in order to make the pages dynamic and appropriately display the studies contained in the database.

As the development went on, however, the client requested PPO's analyses – articles similar to studies to also be included into the CMS. The client also requested various features such as manual reordering of the studies in the recent studies section, multiple user levels instead of one, ability to upload more than a set number of PDFs and other content manipulation features. Therefore, the scope expanded as the project went on and instead of the projected 4 months, the development took over a year.

CHAPTER TWO: REVIEW OF TOOLS AND TECHNOLOGIES

REVIEW OF EXISTING SOLUTIONS AVAILABLE

There are numerous web sites and companies that run into similar problems as PPO due to their content being static. The main solution is to convert the static content into *dynamic content* - "information on web pages which changes or is changed automatically, e.g. based on database content or user information" ("Dynamic content", n.d. Dynamic content requires the use of a scripting or a programming language such as PHP, Java, CGI or Coldfusion and some kind of a data storage system such as a database, file system or hard coded text.

The programming language is used to generate the HTML pages that the user sees. Instead of simply displaying the text, the programming languages can be used to generate the appropriate content based on the user, program inputs or parameters. For example, if a user logs into an administration panel of the system, the menu options, messages and features would be different for an administrator than for a user with fewer privileges. Thus the possibilities of how the content, navigation and features can be displayed on a website are endless and depend on the requirements of a particular business situation. In the end, the HTML page seen by the user looks the same as before, but the way it is constructed and generated is very different.

The purpose of most of the websites on the World Wide Web is to convey information: text, images, videos and products to its visitors. All this information resides on a *web server* – "A computer that is responsible for accepting HTTP requests [...] Web browsers, and serving them Web pages, which are usually HTML documents and linked objects (images, etc.)" ("Web Server", n.d). The information

or data can be stored in various forms: static text encoded into HTML pages, data in a database, or text hard-coded into a dynamic page.

The problem with storing information in HTML files or programming files like PHP is that any modifications require a person skilled in HTML or PHP. Storing data in separate text files is an obsolete method and presents readability, portability and security issues. A database is the best solution for information and data storage.

The advantages and disadvantages of databases are as follows:

Advantages

- Reduced data redundancy
- Reduced errors in updating content and increased consistency
- Greater data integrity and independence from applications programs
- Improved data access to users through use of host and query languages
- Improved data security
- Reduced data entry, storage, and retrieval costs
- Facilitated development of new applications program

Disadvantages

- Database systems are complex, difficult, and time-consuming to design
- Substantial hardware and software start-up costs
- Damage to database affects virtually all applications programs
- Extensive conversion costs in moving from a file-based system to a database system
- Initial training required for all programmers and users ("Database", n.d)

A database together with a dynamic page generation would be the best solution for PPO's problems caused by the static content and poor file organization. Due to the number of web database options and programming languages available, the main question that had to be answered was which technologies to choose.

In order to eliminate the role of a webmaster or someone familiar with HTML, database concepts and programming, a Content management system (CMS) can be used to allow non-technical personnel to make changes to the data in a database via a web interface. Hence, a CMS was the best solution for PPO.

CONTENT MANAGEMENT SYSTEM (CMS)

According to Wikipedia, a content management system (CMS) is “a computer software system for organizing and facilitating collaborative creation of documents and other content” (“Content Management System”, n.d). This project, however, involved a web content management system – “a web application used for managing websites and web content” (“Content Management System”, n.d).

The following diagram depicts the structure of the CMS developed for PPO.

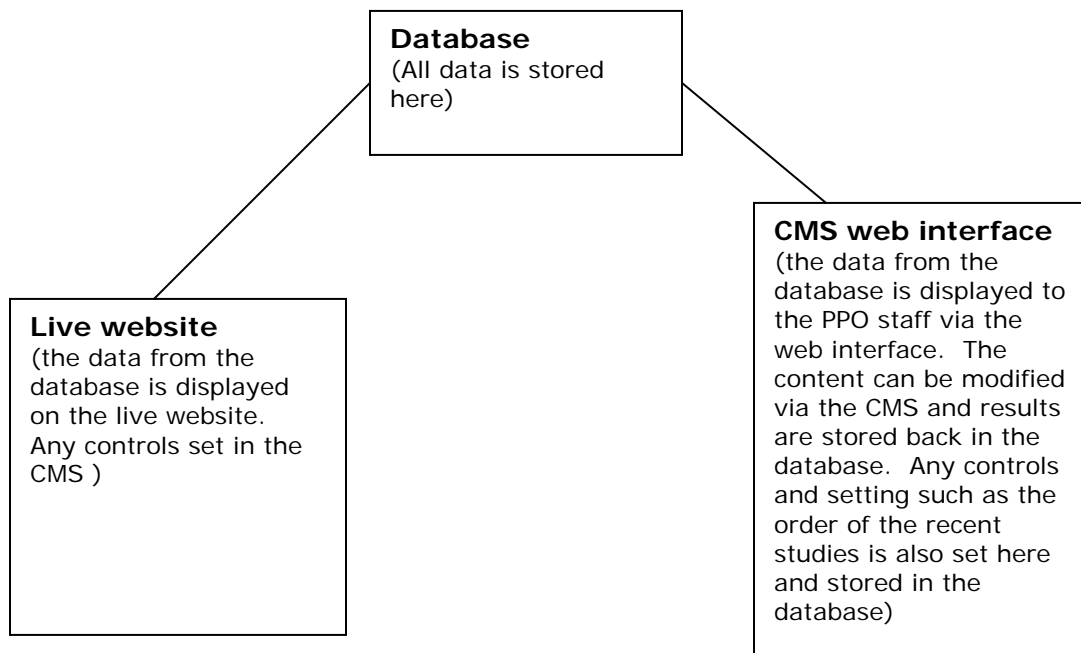


Figure 1

This diagram illustrates the general structure of how the CMS works: all the content, file locations, settings such as display order and other parameters are stored in the

database. The database is the central part of this application and that is why proper database design is so important.

The live website is coded in the PHP programming language. PHP is used to access the database and retrieve the appropriate data from the database and display it in the correct format. In essence, PHP converts raw data into information that can be understood by website users. The CMS interface is also coded in PHP, but in addition to displaying the data it allows the PPO staff to manipulate the data and save the changes to the database. Those changes are then reflected in the live part of the site.

REVIEW OF THE PROPOSED TOOLS AND TECHNOLOGIES

The tools and methodologies proposed for PPO's CMS development were the following:

- **Lunarpages.com hosting service**

Lunarpages provides a reliable, affordable hosting service. The basic package of Lunarpages costs only \$6.95 a month and includes 5Gb on storage, 400GB of bandwidth, unlimited MySQL Databases, PHP support. This is a cost-effective solution that provides all the services that PPO would need to host their website. Furthermore, Lunarpages has impeccable customer service and support.

- **MySQL database**

MySQL "is an open source [relational database management system] (RDBMS) that relies on [structured query language] (SQL) for processing the

data in the database" ("MySQL", n.d.). MySQL is a freely available, reliable database the latest version of which is supported and included in the hosting plan offered by Lunarpages.com. Unlike Oracle or MS SQL, MySQL is a free resource and offers the same security, multiple users, relational database features.

- **Hyper Text Markup Language (HTML)**

HTML is "a markup language designed for the creation of web pages with hypertext and other information to be displayed in a web browser" ("HTML", n.d). HTML is used to structure information (arrange the menu on top, content in the center), format information with the help of colors, font sizes and font styles, display images, media files and so on. Although a page can be coded dynamically with the help of a programming language such as PHP, the end result is still an HTML page.

- **PHP programming language**

"PHP is a server-side, cross-platform, HTML embedded scripting language that lets you create dynamic web pages. PHP-enabled web pages are treated just like regular HTML pages and you can create and edit them the same way you normally create regular HTML pages" ("PHP", n.d).

PHP is a freely available language that is supported by most hosting services on the market. According to Dan Orzech of Zend.com, PHP holds the following advantages over languages like Java and or ASP:

1. Exceptionally short learning curve
2. Quick development time
3. Very high performance

4. Can integrate with Java classes and JSP
5. Platform independent (2001)

- **JavaScript**

“Javascript can interact with HTML source code, enabling Web authors to spice up their sites with dynamic content” (“Javascript”, n.d.). Javascript is a client side script that makes it possible to enhance user interface by performing certain functions like dynamic HTML manipulation and HTML form validation without roundtrips to the server. Thus the user does not have to wait for a page to reload.

- **Cascading Style Sheets (CSS)**

“Cascading Style Sheets (CSS) is a stylesheet language used to describe the presentation of a document written in a markup language” (“CSS”, n.d.). CSS is used to apply formatting, structure and interactive elements to HTML documents. The main advantage of CSS is that the files are stored in a separate location and can be applied to multiple HTML documents throughout the website.

PURCHASING A CMS VS. DEVELOPING A CUSTOM ONE

There are various CMS solutions available on the market such as Movable Type, Consolo , Ektron as well as numerous open source CMS. Each of these solutions is aimed towards different types of businesses: Movable Type is a relatively simple and costs only \$49.95 for 1-5 users for non-profit organizations. Ektron’s CMS400.net solution comes with more features like blogging, forums, document management but is also significantly more expensive at \$8939 for up to 10 users. Consolo claims that their services can be used for any size business with basic license costing \$995 for up to 10 users.

PPO is a small organization and the CMS fitting the existing requirements needed to be relatively small and simple. Table 1 describes pros and cons of various CMS solutions that lead in the decision to develop a custom CMS.

	Inexpensive Commercial CMS (i.e. MovableType)	Open-source CMS	custom CMS
Costs	\$49.95	Free	\$3000 (initial quote, including integration)
Customization	Medium to Difficult	Medium	Very Easy
Learning curve	Medium	Medium-High	None
Integration	Developer time required	Developer time required**	Developer time required*
Adding new features	difficult	Medium - difficult	Easy

Table 1

* Although a custom CMS requires developer time to integrate with the website, the main difference is that since the CMS is designed specifically for the website, integration is planned before hand and is therefore much easier.

** The amount of developer time depends on which open-source CMS is selected, some are easier to integrate than others.

Overall, the advantages of a commercial or open-source CMS solution are that it can be purchased for a set price, can have various features already built in, and can include support and maintenance packages. The disadvantages are that the purchased CMS may be hard to integrate, customize, expand and maintain than a custom one. Therefore, while offering upfront savings, the commercial or open-source product may actually cost more.

Based on the initial PPO requirements and business needs, the web team decided that developing a custom CMS solution would be more appropriate. PPO had very specific needs, narrow scope and would not need all the extra features offered that come with a commercial CMS. Furthermore, based on the requirements, the CMS would be relatively simple, and would be easy to integrate and customize.

MYSQL VS. OTHER DATABASE TOOLS

Although there are various database tools available on the market such as Oracle, Microsoft SQL Server, PostgreSQL, MySQL was the best solution for the business requirements of this project based on the following reasons.

1. Since PPO was hosting the website with a hosting company, not in-house, the chosen database had to be supported by the hosting provider. Oracle and MS SQL Server are large, expensive commercial database and are generally not supported by hosting providers or significantly increase the cost of hosting.
2. MySQL version 5.0 offers all the relational database features and tools needed to create, develop and maintain a reliable, secure multi-user database. The latest version of MySQL was already installed and set up on Lunarpages. Furthermore, database support was included in the package and PPO would not need to worry about paying database maintenance fees to outside contractors.
3. The CMS project was relatively small and simply did not require a large database like Oracle. MySQL database would be sufficient to handle the CMS.

LITERATURE REVIEW

Selecting the right technologies for the PPO project such as PHP, CSS and MySQL was based mostly on the web team's experience, skills and the client's requirements. Most of the research was performed on the various types of content management systems, the benefits of developing a custom CMS versus purchasing one and the best strategies on how to implement a CMS efficiently.

The following articles on CMS solutions offered useful information for the PPO project. James Robertson in the article called "So, what is a content management system?" offers a description of the anatomy of a CMS and how the life cycle of content management works (2003). In another article, titled "How to evaluate a content management system" James Robertson provided a useful guide on how to select the best content management system, how to evaluate business requirements and what features a CMS could have (2002). The article also states that it is important to have clear definitions and understanding of any technology before it is developed – not only does it help when every member of the team is on the same page, but also the basic knowledge of various CMS concepts ensures a more efficiently implemented system.

In addition to researching general information on established CMS concepts, articles about evaluating various CMS solutions and how to best develop a custom system were essential in making the right decisions. For instance, according to Victor Lombardi, managing the complexity of a content management system can be very challenging: "content management most likely requires contributions from many different skill sets and coordination across diverse departments and roles" (Lombardi, 2004). Although the PPO project was relatively small and simple, the following principles outlined in the article could also be applied to it:

- Keeping the team small make communication and coordination easier

- Efficient information architecture is very important since presentation of the various content can affect CMS's efficiency
- The CMS should only have the features that are truly needed by the company and the cost of the CMS should not exceed the cost of performing the CMS-automated actions manually
- Technology and design must be tightly integrated since "content management software involves certain components, such as content entry screens, that require a combination of interaction design, information architecture, writing, and database programming skills" (Lombardi, 2004).
- The CMS must be rolled out fast enough in order to keep up with the changes in the organizations' business processes.

And finally, research of existing content management software systems allowed the web team to evaluate different features and methodologies.

In addition to the above sources, the following list on online resources proved to be helpful in the initial research on CMS development practices:

1. "CMS Watch". <http://www.cmswatch.com/CMS/> is a great resource of the latest trends and articles on the CMS systems and development techniques.
2. "Content management system". Wikipedia.
http://en.wikipedia.org/wiki/Content_management_system Wikipedia offered a lot of background information on what a CMS is and how it works. It also had a useful comparison on various CMS systems that was helpful in deciding whether to select an already made system or develop one from scratch and presenting the background information to the client.
http://en.wikipedia.org/wiki/Comparison_of_content_management_systems
3. KM World (<http://www.kmworld.com>), the CIO magazine (<http://www2.cio.com>) and vendor websites such as Movable Type <http://www.sixapart.com/movabletype>)

and Ektron (<http://www.ektron.com/>) also proved to be useful resources that contained various articles and answers by experts on issues concerning managing content and the CMS. Some examples are:

1. "Getting More from Your Content Management System" by Rebecca Wettemann.

<http://www2.cio.com/analyst/report2671.html>

2. "Open-source CMS: On the rise" by John McGrath.

<http://techupdate.zdnet.com/techupdate/stories/main/0,14179,2897730,00.html>

3. "Managing for Usability" by Robert Bolds

<http://www.kmworld.com/Articles/ReadArticle.aspx?ArticleID=8781>

4. "Automating the Business-Forms Lifecycle" by Michael Moon

<http://www.kmworld.com/Articles/ReadArticle.aspx?ArticleID=8783>

5. "Centralizing web content management – ask the expert". Katarina Bonde.

<http://www2.cio.com/ask/expert/2001/questions/question772.html>

6. "Affordable Content Management - Ask the Expert - CIO" Martyn Christian

<http://www2.cio.com/ask/expert/2001/questions/question811.html>

7. "Content Management. Executive summarie.

<http://www.cio.com/summaries/web/content/index.html>

8. "Vendor Selection: Beyond The Hype" by Tony Kontzer

http://www.informationweek.com/839/online_cmside.htm

SUMMARY

Selecting the right technologies and tools is an important step and it depends on several factors: cost, availability, learning curve and current employee knowledge, features and compatibility. In addition to standard web techniques such as HTML, Javascript and CSS, the best choice for the programming language and the database for the PPO project were PHP and MySQL. In addition to the benefits of those

technologies described above, another important factor was the experience of the web team with these tools. In fact, the learning curve can be quite costly and has to always be taken into consideration. This is another reason why it is sometimes easier, faster and more beneficial in the long run to develop a certain product from scratch than purchase an already-made solution that is difficult to integrate and customize. Researching potential solutions and learning how to use them can be a time consuming and costly process and most of the time it is not worth the effort in simple cases like PPO's.

It is also important to note that the practice of developing everything from scratch and disregarding the work already done and technologies out there should not be employed either. Often certain techniques have already been discovered and there is no reason to reinvent the wheel. In each case, all sides must be weighted carefully and the most appropriate solution chosen with care.

CHAPTER THREE: PROJECT METHODOLOGY

RESEARCH METHODS USED

The main research that needed to be done for the project had to do with selecting the right hosting provider, evaluating various CMS systems on the market, deciding on technologies that are to be used for developing the CMS and incorporating dynamic content into the website. The main sources where that information was obtained were professional articles about the latest versions and features of PHP, MySQL and the CMS; reviews and comparison charts of various open-source CMS and vendors' websites.

SOFTWARE DEVELOPMENT LIFE CYCLE MODEL

The project followed the standard *software development life cycle* (SDLC) model with the analysis, design, development, testing, implementation and maintenance phases.

RESEARCH AND ANALYSIS PHASE

BUSINESS PROCESSES ANALYSIS

The project began with a series of meetings with the PPO staff in which the main requirements were outlined and defined. The web team had to familiarize itself with the study publishing process, the process participants and how the new system would affect the study publishing process, i.e. eliminate the role of a webmaster. Other business processes and operations such as initial report creation and polling of the public were not relevant to this project and did not affect the website or the CMS system.

The initial business process analysis and requirements gathering can often be a time consuming and complicated process. It cannot be overlooked however, since the requirements affect everything from the business rules and the scope of the project to the design and development of the database and the website. Typically the business process analysis can be performed through interviews, meetings and any written documents that the company has. Business process analysis stage was simplified for this project, since the web team had to focus on mainly one process - the study publishing process. Although there was no documentation, several meetings and interviews with the webmaster and the rest of the PPO staff made it possible to clearly outline how a typical study was published on the website, what problems and issues participants had and what the participants expressed they would have liked to change in the ideal scenario.

For instance, the webmaster expressed frustration at frequent request changes after he completed the HTML pages. He also said that there were no clear guidelines for the web processes since he was the only one with web development knowledge and previous webmasters had other methodologies for creating web pages, images and organizing files. Therefore, the lack of uniform guidelines and naming conventions led to confusion and inconsistencies.

The previous study publishing process included the following steps:

1. PPO staff writes the report and the supporting documents based on the polling data.
2. The webmaster converts the report into HTML pages, creates the accompanying images and puts the files on the server for review by the PPO staff.
3. PPO staff reviews the HTML pages and submits edits (if any) to the webmaster who implements them (note – this process often has multiple iterations).
4. Once the report is approved and is about to be made live, the webmaster creates a duplicate version of the front page on which the new study appears in the center.

The links to the previous study documents are moved to the 'recent studies', the last study is moved to the 'latest studies' and the archives page is updated if necessary. The email newsletter is also created at this point.

With the CMS the study publishing process would be the following:

1. PPO staff writes the report and the supporting documents based on the polling data.
2. PPO staff member logs into the CMS control panel to create a draft study.
3. PPO staff can preview and make edits to the new study, they are also able to generate and preview the email newsletter.
4. Once the study is finalized, it is published and made live. The previous 'live' study automatically moves into the 'recent studies' section and the other sections are updated as well.

ILLUSTRATION OF WEBSITE PROBLEMS:

The following is a brief illustration of the problems that existed on the PPO website in addition to the flawed process of content publishing. After the web team analyzed the state of the website, problems with naming conventions, content organization and layout and usability were discovered. Furthermore, the HTML coding practices were obsolete with all the formatting being hardcoded into the pages via HTML tags such as , and so on. The tag allows to set the style and size of the font and The tag is used to make the font bold. The problem with using these tags to format content is that if the format needs to change, all of the tags need to be changed in all the places where they are used. CSS and new coding practices allow the developers to define formatting in just one file, so that any changes need to only be done once in one place.

```

<P><FONT face="Verdana, Arial, Helvetica, sans-serif"
size=2><STRONG>23 Nation Poll on UN Reform </STRONG><BR>BBC
World
Service Poll</FONT><BR>[<FONT
face="Verdana, Arial, Helvetica, sans-serif"><FONT color=#cc3300
size=2>March 20, 2005</FONT></FONT>] <STRONG></STRONG></P>
<P><FONT face="Verdana, Arial, Helvetica, sans-serif" size=2><A
href=" ">Report
of Findings </A><BR><A
href="">Questionnaire</A></FONT></P>
<P><FONT face="Verdana, Arial, Helvetica, sans-serif"
size=2><STRONG>The Federal Budget: The Public's
Priorities</STRONG><BR>A PPO/Knowledge Networks
Study</FONT><BR>[<FONT
face="Verdana, Arial, Helvetica, sans-serif"><FONT color=#cc3300
size=2>March 7, 2005</FONT></FONT>] <STRONG></STRONG></P>

```

Figure 2

The above figure illustrates the coding problem. The tag **** is repeated through out the HTML document. This tag is used to define the font face as Verdana. If the formatting requirement had changed, the font face type would have to be updated manually on every single page and every single occurrence which would take a significant amount of time to do.

Poor coding can lead to a number of other problems: incorrect display of the website by certain browsers and formatting inconsistencies. Adding new elements and changing layout of the site can also be very difficult. Hard-coded elements coupled with static content can result in hundreds of lines of cluttered code and hundreds of pages needing to be updated and maintained. The larger the site, the more difficult it becomes to avoid redundancies and inconsistencies in information and data.

Since PPO's website had to be modified in order to display dynamic content, replacing those pages with the standard compliant and dynamic pages was a necessary addition to the requirements.

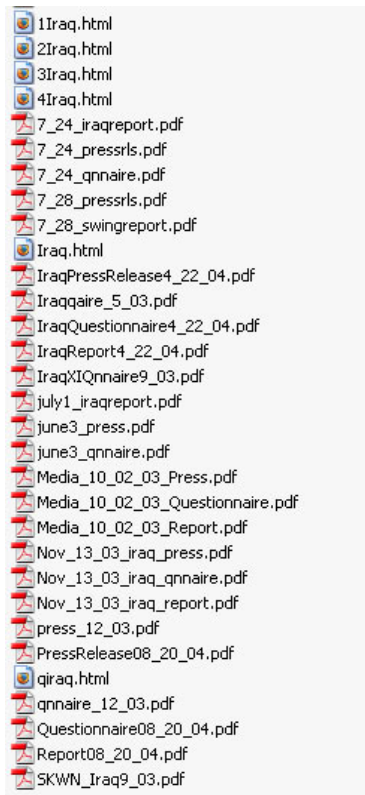


Figure 3

The problems with inconsistencies and poor naming conventions are illustrated in the figure above. Some report names included the creation date; other reports were just named in the manner of report1.pdf, report2.pdf. Some dates included the publication year, while others did not. Dates appeared in the end, middle and beginning of the file names. Lack of file naming conventions caused ambiguity and made it difficult to find and manage files since it was not clear what they related to. Files were poorly organized with folders containing a mix of various HTML documents and image files.

To remedy the situation strict naming conventions were proposed for all files.

The new conventions was: dd_mm_yyyy_filename. Thus all files could be sorted by date. Furthermore, file names would have to be alphanumeric and could not include any special characters or spaces besides the underscore. Furthermore, files would be grouped by a polling topic and in folder by file type.

PPO

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[Studies of US Opinion](#)
[Studies of World Opinion](#)
[Links](#)
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[Home](#)

The Program on International Policy Attitudes (PIPA) carries out research on public opinion on foreign policy and international issues by conducting nationwide polls, focus groups and comprehensive reviews of polling conducted by other organizations.

PIPA is a joint program of the Frederick S. Edgerton Center for Global Policy (ESGC) and the Center for International and Security Studies at Maryland (CISISS), School of Public Affairs, University of Maryland.

To join our email list and receive notification of new PIPA polls and events, please send an email to info@pipa.org with "subscribe" in the subject line.

What's New

LIVE STUDY

A public opinion poll across 23 countries finds that in 20, a majority (17) or a plurality (3) of citizens think it would be mainly positive for Europe to become more influential than the US in world affairs. Currently, Europe is seen as having a mainly positive influence in the world in 22 countries among specific major countries. Positive influence is seen in 17 countries, while negative influence is seen in 3 countries. The poll of 23,518 people was conducted by the international polling firm GlobeScan together with the Program on International Policy Attitudes (PIPA) at the University of Maryland. The 23-nation fieldwork was coordinated by GlobeScan and completed during December 2004 in most countries. The poll included some questions (previously reported) that were fielded for the BBC World Service.

On average, across all countries polled, 58 percent favor Europe becoming more influential than the US in world affairs. Excluding European countries, the average is 53 percent. The most enthusiasm for greater European influence (other than in Europe) is among US neighbors—Mexico (66%) and Canada (63%)—and China (66%), South Africa (63%), Australia (62%), and Russia (60%). The only countries where a majority sees this prospect as negative are the Philippines (54%), and the US. However, among Americans only 55 percent see it as negative while 34 percent say it would be positive, reflecting the deep political divide among Americans over US foreign policy. Indians are divided, with 35 percent saying mostly positive, 38 percent mostly negative.

[Full Mon...](#)

For more information on the GlobeScan/PIPA study see: [Report of Findings](#), [Questionnaire](#)

Recent Studies

23 Nation Poll on UN Reform
BBC World Service Poll
[March 20, 2005]
[Report of Findings](#), [Questionnaire](#), [Press Release](#)

22 Nation Poll on China
BBC World Service Poll
[March 5, 2005]
[Questionnaire](#), [Press Release](#)

20 Americans on the Darfur Crisis and the International Criminal Court
A PIPA/Knowledge Networks Study
[March 1, 2005]
[Press Release](#), [Questionnaire](#)

22 Nation Poll on the Global Economy
BBC World Service Poll
[January 25, 2005]
[BBC World Service Poll](#), [Methodology and Questions Asked](#)

Americans on the Darfur Crisis
A PIPA/Knowledge Networks Study
[January 25, 2005]
[Questionnaire](#), [Press Release](#)

22 Nation Poll on Bush's Re-election
BBC World Service Poll
[January 19, 2005]
[BBC World Service Poll](#), [Questionnaire](#)

Digest

Americans and the World Digest
Comprehensive analyses of US public opinion on international issues.

Global Issues
[Biotechnology](#)
[Globalization](#)
[Global Warming](#)
[Human Rights](#)
[International Trade](#)
[Population](#)
[Terrorism](#)
[United Nations](#)
[Women's International Issues](#)

Regional Issues
[Africa](#)
[China](#)
[Israel and the Palestinians](#)
[Russia](#)

Adobe Acrobat is required for reading PDF files. If you don't have Adobe Acrobat, please click [here](#) for free download.

Latest Studies

- Opportunities for Bipartisan Consensus: What Both Republicans and Democrats Want in US Foreign Policy:** A PIPA/Knowledge Networks Study [Jan. 18, 2005]
- Americans' Election:** A PIPA/Knowledge Networks Study [Oct. 2, 2004]
- The Separate Realities of Bush and Kerry Supporters:** A PIPA/Knowledge Networks Study [Oct. 2, 2004]
- The Hall of Mirrors:** A Chicago Council on Foreign Relations/PIPA/Knowledge Networks Study [Oct. 1, 2004]
- Misperceptions, The Media and The Iraq War:** A PIPA/Knowledge Networks Study [Oct. 2, 2003]
- Americans' Reaction to the 2004 US Presidential Election:** A PIPA/Knowledge Networks Study [Oct. 28, 2004]
- The Separate Realities of Bush and Kerry Supporters:** A PIPA/Knowledge Networks Study [Oct. 23, 2004]
- The Hall of Mirrors:** A Chicago Council on Foreign Relations/PIPA/Knowledge Networks Study [Oct. 1, 2004]

- Public Perceptions of the Foreign Policy Positions of the Presidential Candidates:** A PIPA/Knowledge Networks Study [September 29, 2004]
- 25 Nation GlobeScan Poll on US Presidential Election:** A PIPA/Knowledge Networks Study [Sept. 29, 2004]
- World React to World Opinion:** A PIPA/Knowledge Networks Study [September 8, 2004]
- Attitudes About Iraq:** A PIPA/Knowledge Networks Study [August 20, 2004]
- Americans on Torture:** A PIPA/Knowledge Networks Study [Jul. 22, 2004]
- Americans on the Crisis in Sudan:** A PIPA/Knowledge Networks Study [Jul. 26, 2004]
- How Americans Would React to World Opinion:** A PIPA/Knowledge Networks Study [September 8, 2004]
- U.S. Public Beliefs and Attitudes About Iraq:** A PIPA/Knowledge Networks Study [August 20, 2004]
- Americans on Torture:** A PIPA/Knowledge Networks Study [Jul. 22, 2004]
- Americans on the Crisis in Sudan:** A PIPA/Knowledge Networks Study [Jul. 26, 2004]

LATEST STUDIES

Figure 4

The above figure illustrates the poor layout and organization of the PPO website which made it difficult for the users to navigate and use the site. The live study section should only contain the one or two small paragraphs with a “read more” link to the full text of the study. Placing 3 large paragraphs significantly increased the page length forcing the user to scroll down. The latest studies section increased the page length even more and the user would have to scroll down in order to see it. Thus users could miss this section all together if they failed to scroll down. In order to improve the usability of the site, part of the CMS project was to redesign the front page and to re-organize the content in a more user-friendly manner.

PROJECT REQUIREMENTS

After the initial series of meetings, analyses and consultations, the project had the following requirements:

1. Design and develop the content management system to have the following features:

- a form for creating/editing a study
- control panel that lists all the studies by section and date
- study delete functionality
- newsletter draft preview functionality
- dynamic generation of the email newsletter HTML file that is later mailed to PPO members.
- study draft preview functionality
- audit trail for a study – list of the dates that changes were made and users who made changes
- list of visitor statistics

2. Convert static HTML pages on PPO website into dynamic PHP pages that display content stored in the database.
3. Re-structure the layout of the PPO's home page in order to enhance usability
4. Move PPO website to a new hosting provider – Lunarpages, since the previous hosting provider did not support the latest versions of PHP and MySQL.
5. Set up strict file naming conventions and rename PPO's static files such as PDF documents, images and Word documents to conform to those conventions. Organize PPO files and place them in appropriately named folders.

TRAINING PLAN

Majority of PPO's staff members were researchers without any technical background. An important aspect of the project was to set up a training plan to ensure that the CMS system would be used correctly. Providing accurate documentation and tutorials that describe the steps necessary to use the CMS was an important part of the project. The web team also planned on setting up training sessions in order to train the staff on how to use the CMS.

DESIGN PHASE

The design phase is one of the most important phases of the project life cycle. Mistakes or miscalculations made in this phase can cause the entire project to fail in the development or implementation phases. The web development team spent a great deal of time working out the elements described below.

BUSINESS RULES

According to Wikipedia, "*business rules* describe the operations, definitions and constraints that apply to an organization in achieving its goals" ("Business Rules", n.d). For instance "two studies cannot be in the 'live' section at the same time" is a business rule.

Defining the business rules is important for all aspects of project design. Business rules are crucial for any project and aid project participants in designing and implementing the system; knowing what the system should do and what its constraints, limitations and requirements are. It is impossible to achieve that without business rules. It is important to limit the scope of the project and communicate restrictions and requirements to all project participants. The scope of an information technology project can easily expand beyond the budget and time schedule if it is not limited by business rules. Business rules must be clearly defined and analyzed, since better understanding and definitions lead to improved application design and a reduced number of misunderstanding and miscommunications.

INFORMATION ARCHITECTURE

Information Architecture is defined by the Information Architecture Institute as

1. The structural design of shared information environments.
2. The art and science of organizing and labeling web sites, intranets, online communities and software to support usability and findability.
3. An emerging community of practice focused on bringing principles of design and architecture to the digital landscape. ("Information Architecture", n.d.)

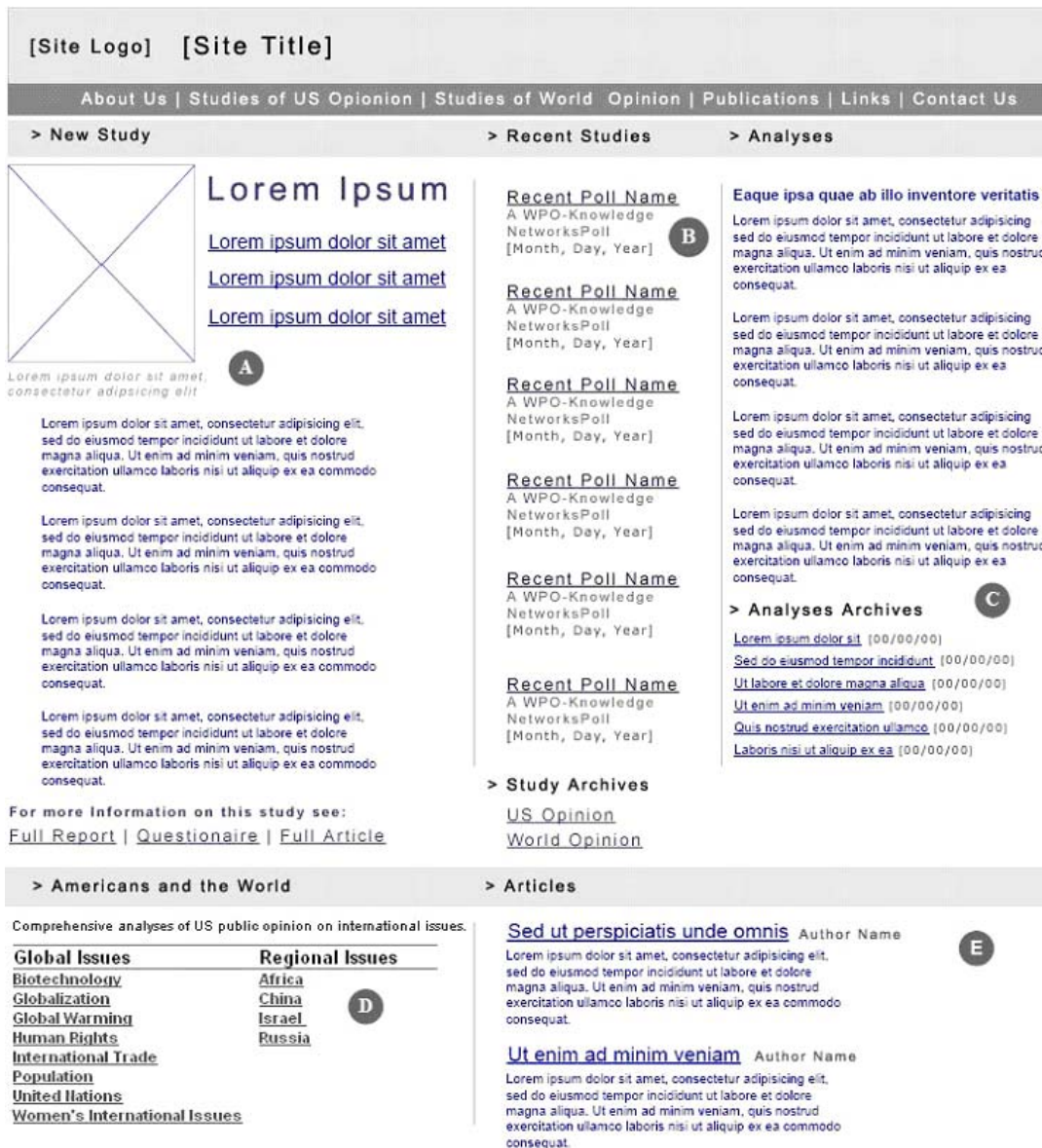


Figure 5
Sample Information Architecture Document

The Information Architecture Prototype in the figure above identifies the main areas of the home page to be considered for implementing in the Content Management System.

- A. The New Study Block Features the Primary Release study of the week, generated from the CMS. Primary fields are Title, Sub-Title, Image, Image

Caption, Summary Content, Full Content Link, PDF Report, PDF Questionnaire links, and related links.

- B. The Recent Study Block contains recent studies featured and populated from a database. The Study Title links to further content. Primary Fields Are Title, Polling Organization, Study Date/Last Updated. When a new Primary Release is posted, the previous Primary Release gets moved into the Recent Studies. The oldest Recent Study gets moved into the Study Archive, under one of two sections: US Opinion or World Opinion.
- C. Analyses section that features CMS Driven content of Analyses articles. The most recent article gets published with a summary and any additional links, while the older ones are moved to the archive with a date of publication.
- D. Links to American Digest, dynamically pulling the most recent studies from the Website digest.
- E. List of Scholarly Articles, with links to those publications.

The main purpose of the Information Architecture document is to simplify the communication process between the client and the web team: it allows both sides to discuss and brainstorm the placement of all elements on the website before the actual development is done. This way the element placement is finalized and is not altered during or after development – which can be a rather costly undertaking.

DATABASE DESIGN

Database design starts from the business rules. The goal of a database is to satisfy all of the business rules and they can be used as one of success evaluators.

The database design phase included the design and creation of the *Entity Relationship diagram* (ERD) and the description of the tables' attributes.

It is important to note that database design should not be overlooked and can potentially affect the efficiency of the entire system. The static content problem brings up the issue of information redundancy – unnecessary duplication that can lead to inconsistencies. Poorly designed databases can also be prone to the problems of data redundancy and data inconsistencies.

INTERFACE DESIGN FOR THE CMS

The content management system web interface was designed at this stage. As with the main PPO website, it needed to be user-friendly and intuitive. Furthermore, since PPO required multiple user access to the CMS administrator panel, user roles needed to be defined and described. This was important since certain parts of the interface and navigation were not available to certain users. For example, if an intern at PPO office was given permissions to edit a study and upload PDFs but not to publish it, the publish button would have been disabled. Since certain parts of the interface needed to be disabled or hidden, the graphical look of the CMS administrator area needed to be thought out more carefully since hidden elements could affect usability and interactivity of the site. The interface document illustrated below can greatly aid in making the above decisions.

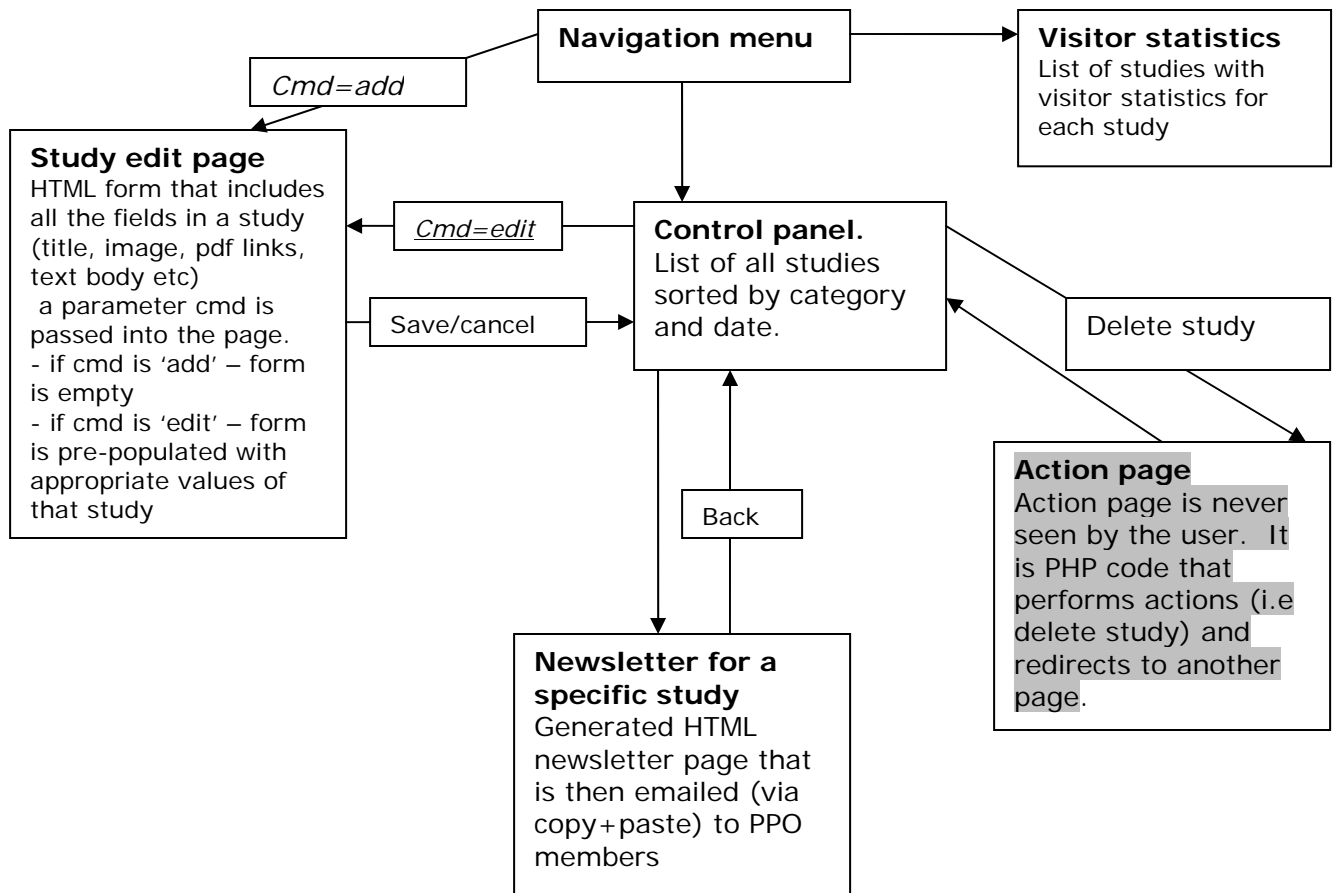


Figure 6
Sample CMS interface document

The figure above depicts a sample CMS interface document. The document describes the pages that are a part of the CMS where the user logs in to make changes to the data. All the navigation and actions such as delete a study or save a study are also depicted. The main goal of this document is to simplify the internal communication between the developer and the designer by offering a visual reference on how the system is laid out and how it works. For instance, the document clearly states that if the user clicks "Save" or "cancel", he is redirected to the control panel; that the newsletter page is also accessed through the control panel and that the visitor statistics page is accessed through the main navigation menu.

DEVELOPMENT PHASE

The development phase includes transforming the design document into application code. In this phase the database is implemented, developed and populated with test data; the graphical interface and layout of the CMS administrator area are coded; business logic is programmed and appropriate changes are made to the pages on the PPO website so that the dynamic content is displayed.

It is important to note that before the development phase can begin, the development environment must be set up. The development environment can either be a separate server or an area on the existing server where the new system is built. This guarantees that the live website is not affected and service and business processes continue uninterrupted. It is a good idea to set up the development environment on a server accessible via the Internet. This can allow the clients to monitor the process which facilitates better communication and feedback.

The crucial element in this phase is obtaining frequent client feedback and breaking up the project into smaller deliverables that can be shown to the client. This way if there are any change requests or fixes, they can be addressed immediately and incorporated into the next demo. This technique can significantly reduce the overall project development time. The method used with this project was releasing frequent prototypes and performing demos in order to obtain feedback of the PPO staff.

TESTING PHASE

The purpose of the testing phase is to ensure that all the requirements have been implemented, and that the application contains no errors or inaccuracies. Testing is

typically performed throughout the process of application development. The final testing phase is important to ensure that the end product delivered does not have problems. Due to pressure or deadlines companies often release incomplete projects that have errors. This leads to client dissatisfaction and frustration. Since obtaining customer satisfaction increases the likelihood of the company being selected for future projects, paying special attention to the testing phase and releasing a good quality product was a high priority for this project. The web team used quality assurance (QA) techniques to make sure that the system followed all the requirements properly and contained no errors. This was especially important since the requirements changed significantly throughout the project and the web team was able to stay on top of the changes and ensure high quality of the end product.

IMPLEMENTATION PHASE

The implementation phase involves moving the finished product from the development environment to the 'live' server and replacing the old static pages with the dynamic ones. At this stage the documentation is finalized and released and the PPO staff is trained to use the system. Before the application can be made live, the database is populated with the appropriate data. The data entry was allocated to the primary staff member responsible for using the CMS, this way that staff member could obtain real experience with the system and get all the necessary questions answered in a low pressure environment. The actual release of a study is usually done in a high-pressure situation and any questions or problems that the staff member might have with the CMS were better answered before hand. The restructuring of the files also took place in the implementation phase. New naming conventions were set up and had to be followed by the PPO staff member when entering new content into the database and uploading new files. Once the new

system went live, the old system was backed up and copied onto a CD for future reference.

MAINTENANCE PHASE

The maintenance plan included a series of steps to be performed after the system is successfully implemented. It was necessary to monitor the proper use of naming conventions and file structures. Several member of the web team were “on-call” during the first couple of releases in order to make sure that everything was going smoothly and to fix any problems. Since the system was designed to eliminate the role of the webmaster in the study publishing process and to allow PPO staff to control the content of the website, the maintenance plan included a minimal level of involvement from the web team. Most of the support and database maintenance was covered by the hosting company, with the web team available for consultations.

SHORT REVIEW OF DELIVERABLES FOR EACH PHASE

<i>PHASE</i>	<i>DELIVERABLES:</i>
Analysis	<p>Requirements Document – this document lists all the system requirements. The Requirement Document is produced after the business process analysis, meetings and interviews are conducted to understand the study publishing process.</p> <p>Business Rules – the business rules document is based on the requirements and is used in database design, business logic programming, interface design and so on. It is necessary to limit the scope of the application and what it will do.</p>
Design	<p>Information Architecture Diagram -</p> <p>A diagram representing the structure of information elements on a web page.</p>

	<p>Interface design document for CMS</p> <p>This document consists of diagrams of how navigation in the CMS will look like and the actions that occur. For instance, after clicking “save” on the edit screen the user is redirected to the main control panel.</p> <p>Database design (Entity Relational Diagram (ERD))</p> <p>This document shows the design of the database, the structure of the tables and the relationships among tables.</p>
Development	<p>Working application</p> <p>The working application includes: the working database, the working content management control panel that allows users to modify database content, the dynamic PHP pages that display database content on the PPO website and the front page with the new layout implemented.</p>
Testing	<p>Testing report</p> <p>Testing report includes the test cases which are derived from business rules and requirements and whether the application passed the cases.</p>
Implementation	<p>Database populated with real data</p> <p>The database needs to be populated with actual data before the application goes live.</p> <p>‘live’ application</p> <p>The application is made ‘live’ – i.e. front page has a new layout, all pages are dynamic and content can be edited through CMS.</p> <p>Training material</p> <p>The training manual consists of the tutorial on how to use the CMS.</p> <p>Documentation</p>

	The documentation includes database diagram, business rules, initial and updated requirements, description of PHP functions, interface diagrams.
Maintenance	Completed maintenance requests The maintenance requests (if any) are completed. Completed maintenance requests include actual fixes or modifications of the application as well as a brief description of the request and how it was solved.

Table 2

OUTCOME

The outcome of this project was a working CMS; better organized and structured content as well as the dynamic web site, coded in PHP. PPO home page was also redesigned based on the Information Architecture document (figure 5). The CMS web interface was completed based on the interface design document and the user was able to log in and perform all the necessary modifications to the content in the database.

NEW ANALYSIS || NEW RELEASE || RELEASES || ANALYSES || TOPICS || NEWSLTR/WEB PREVIEW || 'LIVE' || VISITORS || LOG OFF

STUDY MANAGEMENT PANEL

Date	Main Title	Position	Location	
DRAFT STUDIES				
06/11/2006	TEST		publish	Edit Audit
LIVE STUDIES				
05/11/2006	Americans Say US Should Comply with UN Judgment and Change Treatment of Guantanamo Detainees			Edit Audit
RECENT STUDIES		Reposition		
04/25/2006	30-Country Poll Finds Worldwide Consensus That Climate Change is a Serious Problem	1 ▼	Recent Studies ▼ Go	Edit Delete Audit
03/15/2006	Iraq: The Separate Realities of Republicans and Democrats	2 ▼	Recent Studies ▼ Go	Edit Delete Audit
01/11/2006	20 Nation Poll on Free Market system	3 ▼	Recent Studies ▼ Go	Edit Delete Audit
02/28/2006	35 Nation Poll on Iraq	4 ▼	Recent Studies ▼ Go	Edit Delete Audit
02/03/2006	Global Views of Countries	5 ▼	Recent Studies ▼ Go	Edit Delete Audit
01/31/2006	New WPO Poll: Iraqi Public Thinks US Plans Permanent Bases in Iraq	6 ▼	Recent Studies ▼ Go	Edit Delete Audit
01/24/2006	New BBC World Service 32-Nation Poll Rates Global Players, Economic Trends	7 ▼	Recent Studies ▼ Go	Edit Delete Audit
01/11/2006	New Poll: Afghan Public Overwhelmingly Rejects al-Qaeda, Taliban	8 ▼	Recent Studies ▼ Go	Edit Delete Audit
US OPINION ARCHIVE				
03/07/2005	Public Would Significantly Alter Administration's Budget		US Opinion Archive ▼ Go	Edit Delete Audit
03/01/2005	Large Bipartisan Majority of Americans Favors Referring Darfur War Crime Cases to International Criminal Court		US Opinion Archive ▼ Go	Edit Delete Audit
01/25/2005	Three Out of Four Americans Favor UN Military Intervention in Darfur		US Opinion Archive ▼ Go	Edit Delete Audit
01/18/2005	Bipartisan Public Consensus Offers Direction for US Foreign Policy in Second Bush Term		US Opinion Archive ▼ Go	Edit Delete Audit
10/28/2004	Three in Four Say If Iraq Did Not Have WMD or Support al Qaeda, US Should Not Have Gone to War		US Opinion Archive ▼ Go	Edit Delete Audit
10/21/2004	Bush Supporters Still Believe		US Opinion Archive ▼ Go	Edit Delete Audit

Figure 7.
sample CMS screen.

A screen shot of the CMS is illustrated in the figure above. The image is of the main control panel for the CMS. The studies are ordered by the draft, live, recent studies and archives sections. The user can also move the studies between sections by selecting the appropriate location from the drop down in the Location column. The recent studies can be re-ordered and the draft study can be published. This control

panel also allows the PPO staff to delete a study and to go to the edit screen by clicking on the 'edit' button.

New Study

Americans Say US Should Comply with UN Judgment and Change Treatment of Guantanamo Detainees

Large Majority Generally Favors Giving International Courts Broad Authority

Seven in Ten Reject Idea of Exceptions for US

CAMP DELTA

A U.S. Army soldier stands guard on a tower at maximum security prison Camp Delta at Guantanamo Naval Base (Mark Wilson/Getty Images)

Two in three Americans say the United States should change the way it treats detainees at Guantanamo Bay. A large majority of Americans support giving international courts broad authority to judge the cases of detainees. Most Americans reject the idea that the United States should receive exceptional treatment under such treaties.

LIVE STUDY

These are some of the findings of a new nationwide poll conducted by WorldPublicOpinion.org and fielded by Knowledge Networks.

Respondents were told that the UN Commission on Human Rights has determined that the United States has violated international conventions at Guantanamo Bay by holding certain individuals for interrogation without charging them with a crime. Sixty-three percent said the United States should follow the Commission's prescriptions and change this practice, while 30% said the United States should not.

For more information on this study see:
[Full Report](#)
[Questionnaire](#)
[Full Article](#)

Recent Studies

30-Country Poll Finds Worldwide Consensus That Climate Change is a Serious Problem
 Globescan
 [April 25, 2006]

Americans on Iraq: Three in Four Support Troop Presence
 Yankelovich
 [April 11, 2006]

20 Nation Poll Finds Strong Global Consensus: Support for Free Market System
 GlobeScan
 [January 11, 2006]

35 Nation Poll on Iraq
 A BBC World Service Poll
 [February 28, 2006]

33 Nation Poll on Views of Countries
 A BBC World Service Poll
 [February 03, 2006]

New WPO Poll: What the Iraqi Public Wants
 WorldPublicOpinion.org
 [January 31, 2006]

PPO Study Archive

[US Opinion](#)
[World Opinion](#)

New on WPO

- [U.S. Public Favors Raising Auto Fuel Efficiency \(CAFE\) Standards](#)
- [30-Country Poll Finds Worldwide Consensus That Climate Change is a Serious Problem](#)
Concern Growing Sharply
- [World Opinion on China More Positive Than on US, But Slipping](#)
Most Countries, Including in Asia, Comfortable With China's Growing Economic Power
- [Chinese Become Sharply Negative About US, Americans Mildly Negative About China](#)
Both More Negative Than World Average
- [Most Americans Believe Bush Administration is Still Saying Iraq Had Major WMD Program](#)
4 in 10 Americans, 6 in 10 Republicans, Also Believe It Is True

Recent Analyses:

[Among Key Iraq Partners, Weak Public Support for Troop Presence](#)
 (10/14/2005)

[Americans Support Increases in Spending to Meet MDGs, But Only if Other Developed Countries Do Their Part](#)
 (09/16/2005)

[Mexican and US Publics Strongly Support Labor and Environmental Standards in Trade Agreements](#)
 (07/20/2005)

[Iraqi Public Rejects Iranian Model But Wants Major Role for Islam in Government](#)
 (06/14/2005)

[The American Public on the Islamic World](#)
 (06/07/2005)

[French Divided Over EU Constitution](#)
 (05/20/2005)

links to archives

Figure 8

The above figure depicts a screenshot of the redesigned dynamic front page. The content was re-organized to conform to the information architecture document. The Latest studies section was eliminated and distributed between recent studies and the archives. The live study still occupies half of the front page, but the recent studies

and archives are now clearly visible and easily accessible. It can also be seen how the content in the CMS is reflected on the front page. The study named "Americans Say US Should Comply with UN Judgment and Change Treatment of Guantanamo Detainees" in the "live studies" section in the CMS is displayed in the live study section on the front page. Same is true for recent studies –the order and the titles in the CMS control panel correspond to the Recent studies section on the front page.

SUMMARY

Project development is a long and time consuming process. It requires active participation of both the client and the web development team. Open communication is key to building a successful product in the most cost effective and timely manner. All the phases of the project development life cycle illustrated above are important to the success of the project. However, special attention should be paid to the earlier phases of planning and design, since the decisions made in those phases affect the other phases and careful planning should be exercised in order to avoid potential pitfalls at later stages. In certain cases, however, the scope of the project may change and expand and in that case it is important to plan for change and estimate how any changes will affect the system.

Overall, the CMS is an effective way to solve the static content problem and makes a lot of business processes simpler and more efficient. Information architecture and usability principals are effective tools to ensure that the website's content placement and navigation facilitate user friendliness and make it easier for the users to obtain the maximum value from the site.

CHAPTER FOUR: PROJECT HISTORY

HOW THE PROJECT BEGAN

The project began when the PPO's webmaster approached the author and described the problem with the study publication process at PPO. Author's partner and the author set up a meeting with PPO's top management and illustrated the proposal for a content management system and how it will improve the business process of study publishing. They also illustrated the problems with static content and how it can lead to problems with the site and inconsistent content. Author's partner also did a brief presentation on usability and how Information Architecture can be used to better organize the front page. Once the PPO reviewed the initial proposal, project development began with studying the business processes and making a list of business rules and requirements as outlined in Chapter three.

HOW THE PROJECT WAS MANAGED

The project was tracked and managed with the internal tracking system that the web team had. The tracking system made it possible to keep track of requirements, change requests, and stay on top of the due dates for deliverables. Another crucial part of managing this project was keeping track of all communication between the team members and the client and updating the requirements as the change requests from the client came through. Most of the communication happened via email and meetings with the client. The internal tracking system was used to keep track of all the email communication in order to ensure that all project participants were informed and no communications were lost. The internal tracking system was a web application developed by the web team in order to keep track of communication, requirements, work done and billing. Notes from the meetings were also uploaded into the tracking system. In additions to staying on track with communication, it

was important to ensure the version control of all the files the developers worked on. Stargate's Starteam program was used for that purpose. Starteam is useful for check in /checking out files, storing all the previous versions of the files, creating and assigning defects and allowing people working on the same files to merge them correctly. A version control system greatly simplifies software development for any project and eliminates possible errors and inconsistencies that can arise if no version control software is used.

The key to properly managing a project is proper planning, tracking of all the requirements, foreseeing changes and effectively communicating with the client and team members.

CHANGES THAT OCCURRED IN THE PROJECT PLAN

The project plan changed significantly during the development phase of the project. The client requested a large number of new features, interface enhancements and functionalities that affected the business logic, the interface and the database.

For instance, the initial requirement stated that only one study can be published at a time, as the project went on, the top management decided that they wanted the ability to publish more than one study. This decision gave more options to the CMS user and hence required extra interface elements. Furthermore a second version of the home page needed to be designed in order to accommodate two simultaneous live studies. Certain database fields and logic had to be modified as well.

Therefore, a few seemingly simple requests greatly complicated the system that was designed to accommodate different requirements.

As the result of such change requests, there were several extensions of the project release date and PPO was asked to approve additional budget. Overall, the main

strategy of staying on top of communication, keeping track of all requirements, version control and thorough planning allowed the project team to overcome difficulties that arose due to frequent change requests and to produce a successful product in the end.

HOW THE PROJECT ENDED

The project ended when the final version of the dynamic website was moved from the development environment to the live server. Since all the testing was done on the development server and staff training and data entry were completed before going live there were no issues once the system went live. The web team remained 'on call' through the first several study releases, but all the processes went smoothly and there have been no maintenance requests in the year following project completion.

THE PROJECT WAS A SUCCESS

Despite going over budget and taking significantly longer than originally planned, the project was still a success. The project achieved the main purpose of simplifying the study publishing process and solving problems with naming conventions, disorganization and lack of web guidelines. The extra budget and timeline was approved by the client and by incorporating more elements into the project, PPO received a more powerful system than originally planned that allowed them to be more flexible in modifying the content on the website.

The end product met all the initial and additional requirements and helped solve the problems PPO had with the study publishing process. The system met all the goals set for the project:

- Develop a content management system (CMS) to eliminate the problems with static content, content duplication and inconsistencies.
- Provide one place where changes to study content are made by non-technical personnel.
- Reduce study publishing time to 1-2 hrs
- Eliminate the involvement of the webmaster
- Improve website usability by re-organizing the content on the Home Page

And finally, probably the most important indicator of success is that PPO was very satisfied with the outcome and is still using the system without any problems.

WHAT WENT RIGHT AND WHAT WENT WRONG

What went right:

- **Keeping track of all communication**

Since most of the communication was done via email and meetings with clients, it was very important to keep track of it and make sure that nothing was lost. In this case, an internal communication tracking system allowed the members of the web team to convert the notes from the meetings and email requests into change requests that could later be checked off as 'completed'.

- **Utilizing version control**

When multiple people work on the same files, utilizing version control becomes crucial, since certain changes may be overwritten and hours of work lost. The author and her partner used version control software that allowed them to "lock" files they were working on to make sure the other person could not overwrite those files. The software also had a "merge" functionality where changes made by different people were highlighted with

different colors and the files could be successfully merged into one document.

- **Database design**

The table structure was normalized to be in the 3rd normal form – “normal form used in database normalization to check if all the non-key attributes of a relation depend only on the candidate keys of the relation” (“Third normal form”, n.d.). Thus the database was designed to eliminate any redundancies and inconsistencies that can occur when designing tables. There were no technical problems with MySQL, especially since it was already set up and working on the Lunarpages hosting service.

- **Interface design**

The CMS interface was designed to be intuitive and easy to use. First, the web team designed a prototype of what the navigation was going to look like and how the pages were to be linked. Then the interface design document was produced. This document described how navigation in CMS will look like and what actions will occur. For instance, after clicking “save” on the edit screen the user is redirected to the main control panel.

- **Information architecture analysis and implementation**

Usability and information/content placement on a web page can play a big role in how the user interacts with the site. Since it is impossible to visualize all the elements, thorough information architecture design and diagrams helped both the client and the web team design the optimal solution for displaying the items on the web page.

- **Frequent prototyping and feedback elicitation**

The web team held frequent demos to elicit feedback on the changes made to the application and new features added. This was done to make sure that the application was on the right track and to show the client that work was progressing. For example, there were certain interface features such as

button and drop down menu placement, that could only be finalized with the client's approval.

- **Clear communication with the client regarding the need to expand budget/timeline**

When projects exceeded the budget and the timeline, it was very important to communicate that to the client. In this case, once the web team realized that the application was going to cost more and take longer due to change requests, it communicated that to the client in order to avoid any disappointment or misunderstandings on the client's part when the final bill was sent out.

- **Training and data entry**

The training plan consisted of going through all the features with the future users of the CMS and creating a manual that listed all the actions and what the CMS could and could not do. Before the application was moved to the 'live' server, the CMS users were asked to perform data entry of all the old studies into the database. Thus they would go through the study creation process, get familiarized with the CMS and its features and address any problems or ask questions before the system went live.

- **Testing procedures**

The application was tested against the requirements and business rules. This is where keeping track of new change requests, meeting notes and email communications became important – all the items and requests by the client such as "make this font bigger" had to be tracked in order to be verified for completion during the testing phase.

What went wrong (problems and challenges):

- **Internal miscommunication within the PPO team**

PPO is a non-profit with a small number of Senior Researchers, the Director of

the Organization, a Chief Operating Officer and supporting staff. The Director of the organization was not technical or web savvy but had specific ideas about the direction of the organization and had the final approval on every project. Most web initiatives tended to come from the support staff, such as the webmaster or junior researchers, who were more technically and web savvy. Most of the problems stemmed from communicating with the support staff in charge of the project. Many decisions were made by the support staff and communicated to the web team, only to be changed later by the top management.

- The support staff and the web team had trouble eliciting feedback from the top management.
- No clear roles were designated for people involved in the Web Project from the PPO's side. No approval process was set up on the client side to approve the Information Architecture, and System specs. This led to multiple people asking for work and changes to the system that were not approved by the top management.
- While the top management agreed to a redesign and CMS implementation after understanding the general concept at a preliminary meeting, the management did not review the information architecture, business logic, or prototypes leaving that to the support staff.
- The top management asked for changes to the business logic after development began.

- **Non-technical staff making decisions**

Staff in charge of the project did not acquaint themselves with the scope of the system, and did not understand the time and technical issues involved. This led to frustration and miscommunications both on the web team side and the client side.

- **Management of PPO had a hard time understanding the technical aspects of the project, making communication difficult**

The PPO staff involved in the CMS project, as well as the top management were not acquainted with any content management concepts, being familiar only with the concept of a static website. The web team found it difficult to communicate with the client regarding such technical things, such as database, server, and system architecture requirements. The PPO staff did not understand the importance of planning the CMS Interface, business logic, and information architecture of the website. This led to requests for changes to the business logic during and after the development process.

- **Clients' inability to estimate what they really wanted in the system.**

The system was initially designed to follow a straight forward format with a lot of processes being automated for the user. For instance, the following restrictions were initially defined and approved by the PPO management:

- There can only be one study on one specific date
- A study cannot be moved back to the 'live' section
- Newsletter can only contain one study
- There can only be 3 PDFs per study

These requirements were based on the previous studies that rarely deviated from the set format. The advantage of such strict definitions was that they allow for a simpler application, which is easy to use, faster to develop and costs less. The above business rules affected the interface, database structure and coding logic. The main factor that was overlooked by the web team is PPO staff's lack of technical knowledge and the ability to grasp the CMS capabilities and limitations. As the project went on, it turned out that PPO management did not have a clear idea of what the system would look like and what its limits will be. The management did not think through the possibilities of multiple studies being released on the same date or the need to upload more than three PDFs.

- **Scope Creep stemming from the Communication Problems**

After the first prototype, the PPO management came up with the idea that there might actually be cases when two studies are released on the same date, that the newsletter can contain more than one study, that it would be useful to have the option to upload more than 3 PDFs and that there might be a case when a study is moved back to the 'live' section. As the result, these changes affected the structure of the database, the programming logic and the interface and significantly expanded the scope and the timeline of the project.

As the changes were implemented and the work was demonstrated, PPO management asked for additional features beyond the scope. Although PPO did not have a problem with expanding the budget, the timeline increased significantly as well and the growing system became more and more complex and required more meetings, revisions and testing. The end product significantly deviated from the initial requirements with additional features and functionalities.

- **Oversight made during planning may expand into bigger issues**

Although in this case, PPO did not have a problem with extending the timeline and expanding the budget, defining all the extra requirements before hand would have saved the web team a lot of development time since the whole structure of the project would have been planned differently. The problem was that often the clients do not know what they want, especially if they do not have enough technical background to assess the situation. In this case, it might have been a good idea to develop partially implemented prototypes with just the interface that have minimal programming. The client would be able to see the interface, better visualize the system and offer suggestions and any changes before the main structure of the system is implemented. The clients themselves should have taken the time to analyze and think through what they wanted out of the system and how they may have wanted to deviate from the current processes that are being implemented.

PROJECT SUMMARY

The project started because of the issues with the study publishing processes caused by the static content, redundancy, lack of standards, naming conventions and guidelines.

Despite the challenges that occurred during the project and certain things going wrong, in the end, a lot of things did go right and the project was considered a success by both the client and the development team.

CHAPTER FIVE: LESSONS LEARNED

WHAT WAS LEARNED FROM THE PROJECT EXPERIENCE

- **The importance of a good tracking system.** A good tracking system is essential for managing change requests and communications. It aids greatly during testing and cost estimating. In this project, the tracking system allowed the team to keep track of all the communications, change requests and requirement changes. In a project like this one – where the end product was very different from the initial requirements, one of the key elements was to properly track all the changes and document how they affected the interface and the database. Small and large change requests were communicated during meetings, via email and instant messenger. It was very important to record all of them as to not disappoint the client if something was omitted. Furthermore, having a list of change requests made testing easier since the new requirements could be checked off through the internal system. And finally, since the internal tracking system is a web application, the members of the web team and the client were able to access it from any place with Internet Access and evaluate the progress made.
- **The importance of good teamwork.** Any project can encounter difficulties and challenges and this project was no exception. As the requirements changed the effective communication between team members was essential to ensure that the team worked together to communicate the changes made to the interface and the business logic. Good team work and initiatives taken by individual team members can significantly increase the positive outcome of the project and eliminate potential problems down the line. Since certain requirement changes affected both the front-end development such as the interface and information architecture and the back-end such as the database and programming, it was essential that the author and her

partner work together to resolve potential issues that the changes brought. It was vital to think the changes through and listen to the perspective of the “other side”. Some of the programming logic depended on the interface which required all members of the web team to communicate and work together in order to find the most efficient solution available.

- **Good planning is essential for project success.** Although it is impossible to plan for all possible scenarios, thorough planning is essential when it comes to the overall project, the programming strategies, database design and the interface. Planning for change is even more important since unforeseen changes, as in this case, can significantly affect the project. Information architecture diagrams, Interface design documents, database design schemas were all important tools in planning and communicating ideas and requirements.

- **A project will experience problems if there are internal miscommunications among the staff and there is no clear direction of what the client wants. The web team must make sure that top management is involved and understands the importance of the system.** In order for the project to be effective, the client has to have a good idea of what direction the project should go in and what goals should be achieved. In many instances it is difficult for the clients to realize what they want which can make communication with the developers very difficult. Furthermore, internal miscommunications or politics can affect the project as well: in this project, middle management would make decisions that were later overwritten by top management after the change requests were completed. It is important to ask the client to allocate a point-of-contact person that will be responsible for the decisions. Top management should also be involved as much as possible and must understand the importance of the project. In order to achieve that, the web team could send weekly status reports or briefings to

the top management to update them. Furthermore, the developer can help the internal communication by educating the middle management and empowering them to explain and defend decisions.

- **Technical details are inevitable – client must be involved in the process.** Certain understanding between the team members and the clients is also crucial to project success. The biggest problem in this project was overcoming the “language” barrier and the clients’ lack of understanding of the technical aspects of website development. What is important in situations like this one is open and honest communication regarding what is going on in the project: the clients should aim to understand the web team and the web team should aim to speak in the terms that the clients can understand and focus on what is important to them. The web team can also educate the clients, but the clients have to show initiative on their side and realize that the project is important and certain concepts or ideas have to be thoroughly understood. The key for the developer is to limit technical detail as much as possible, simplify things and be prepared for the meetings by trying to look at what they will say from a non-technical perspective. Furthermore, the web team has to stress the importance of client involvement.

- **It is important to address budgetary/timeline concerns with the client immediately, otherwise there may be a conflict when the client sees the bill.** Projects can often experience problems with exceeding the budget and time frame. It is very important to not just foresee what that might happen and to communicate that to the client. In this project due to the client’s requests for extra features, the budget and timeline had to be extended and approved. Failure to recognize the need to ask for a budget/timelines extension may result in the developers losing money or the client becoming surprised and disappointed.

WHAT WOULD HAVE BEEN DONE DIFFERENTLY

Top management would be involved as much as possible

It is important to make sure the top management is aware of the changes requested by the middle management so the changes are not a surprise during demos. Since the last word of approval is up to the top management and certain decisions can be overwritten from above, it is important to make sure that everyone is on the same page. The top management would have been updated on a regular basis via weekly reports that would have stated what has been done, what changes have been discussed and what the system status is. The web team would have tried to get the top management on board early on in the process and get them to see the importance of the system by setting up an individual meetings and going over how early planning of the system would eliminate changes to the business logic during development and what steps are required for the system to be a success.

Client's future needs would be analyzed more thoroughly; client would be helped in understanding what they want before the development starts.

As stated earlier, the client would be better educated about planning the system though the information architecture documents and prototypes. More brainstorming sessions would have been held and more than one business process would have been analyzed. The web team analyzed only the study publishing process, but a more thorough analysis of other website-related business processes at PPO could have helped both the web team and the client foresee the future changes and additions to the site.

The client would have been educated on how business logic relates to content. The web team would run the client through the information architecture and interface prototypes and explain various elements before the meetings.

Educating the client on certain technical aspects is important, since certain decisions cannot be made without some technical detail. For instance, discussing the interface with the client based on the interface design document would require the client to go over the document before the meeting and understand the main elements on the basic level, so that during the meeting the only things discussed would be those elements, their placement and function. More time would be spent on education and planning before the development began, which would in turn shorten the overall development time by preventing the problems that arose in this project.

A time commitment would have been requested from the client. A strict schedule of when deliverables will be presented would be set up. It would be important to make sure the client is prepared for those demos.

The clients need to realize the importance of their involvement. Certain time commitment would have been requested from the client. The web team would ask the client to assign roles to its staff when it comes to the web project, for instance, John Smith is the primary future user, hence will provide feedback on the usability. The web team would also have set up a strict schedule of deliverables and intermediate meetings where the client would need to prepare for the meetings or be educated on certain concepts prior to the meetings.

The requirement gathering stage would be improved.

More time should have been spent on initial prototypes and more scenarios of possible functionalities and features should have been explored. Extensive prototypes showing the clients what the system would look like without it being implemented should have presented. Although the client approved the initial list of requirements and stated that no more features will be needed, the web team should have held brainstorming sessions in order to think through all possible scenarios that

could arise in the future. At the very least, it would have been a good idea to not design a strict system and plan for additional features.

Communication between the web team and the client and between PPO staff and top management would have been improved.

As stated throughout this paper, there were significant communication problems between the web team and the client as well as within PPO itself. Most of the problems and issues were caused by poor communication. The problems resulted from lack of education and understanding of the technical issues on the clients' part; clients' inability to estimate what they really wanted; internal miscommunications at PPO and so on. The key things that would have been changed are:

- Meetings would have been approached from the client's perspective: technical details kept to a minimum. What is presented during the meetings would have been planned carefully so that the client is not lost in too much technical detail.
- PPO staff would have been shown how they can communicate the importance of the project to the top management by educating them and informing them about various aspects and challenges of the project. If better educated, PPO staff would be able to defend their decisions and communicate better with the top management.
- PPO staff would have been educated and provided with materials they could refer to for answers. For instance, the importance of Information Architecture (IA) would be summarized and distributed before the meeting on IA elements.
- Weekly meetings with the client would be held to make sure everything was going as planned and all requirements were being met.

DID THE PROJECT MEET INITIAL EXPECTATIONS

The project did meet and exceed the initial expectations. Despite the additional change requests and new features that significantly increased the budget and the timeline, the end product was more powerful and useful than the original prototype. PPO has obtained much greater value from the new system than it would have from what was initially specified.

NEXT PHASE OF THE PROJECT

The CMS project improved the most essential processes at PPO. The next phase of this project would involve adding more sections of the site to the CMS. The website PPO website also has an articles section – a collection of various articles on Americans' opinion on global issues. Although this is a small section that is not updated as often as the studies, converting its content from static to dynamic would be a useful for any future article publications.

RECOMMENDATIONS

The project ended up being a success and brought a great value to PPO by enhancing its business processes and eliminating the problems that static content, lack of naming conventions and poor organization were causing. What is important to point out is that the project would not have been a success had the extra budget not been approved by the client. Therefore, the main recommendations would be the following:

- **Spend sufficient time on thorough prototyping and information architecture before any programming is done.** As mentioned earlier, good planning makes the development phase much smoother and can prevent the scope creep that occurred in the project.
- **Educate the client, get client to become involved in the project. Plan for meetings from the client's perspective: reduce technical details as**

- much as possible.** The client has to be involved in order for the project to be a success. Educating the client is also important for improved communication and requirement gathering.
- **Make sure (if possible) the internal communication on the client side regarding the project is clear and that everyone including top management are involved in planning.** Internal communication cannot always be controlled or affected, but if middle management and lower staff have a good understanding of the project and the concepts, they are better enabled to communicate those points up the chain.
 - **Do not make extremely strict business rules unless there is very little possibility they may change. Spend some times analyzing other business processes besides the ones related to the problem at hand.**
A more general analysis can help when planning for future enhancements, defining the business rules and designing the interface. Although the requirements may be strict at the time, by seeing other business processes that maybe be added to the CMS in the future, the web team can design a more flexible and agile system from the start that is easier to modify and customize in the future.
 - **Use a tracking system to keep track of all communication and change requests to make sure nothing is omitted.** Regardless of what tracking system is used, recording all the request changes and requirements aids not only in making sure that everything is completed, but also in testing, analysis, time estimating and billing. Therefore it is very important to make sure that all communications are recorded.

CONCLUSIONS

Any project whether successful or not can yield valuable lessons. In fact, sometimes one can learn more from failure than success. The PPO content management system project brought useful lessons in communication, planning, change management and overcoming the language barriers between technical and non-technical participants. Although the project was a success and exceeded the initial expectations, a number of things could have been done differently. In conclusion, the list of recommendation resulting from this experience should be helpful to project participants dealing with similar issues and challenges when trying to improve business processes by utilizing information technology techniques.

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